

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 005953-463	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 03/22628	International filing date (day/month/year) 17/07/2003	(Earliest) Priority Date (day/month/year) 18/07/2002
Applicant CHEVRON U.S.A. INC.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 7 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☒ Unity of invention is lacking (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

5a, b _____

☐ None of the figures.

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C07C13/64 C08G61/00 B82B1/00 B81B1/00 B81B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C C08G B82B B81B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MERKLE R C: "Molecular building blocks and development strategies for molecular nanotechnology" 7TH FORESIGHT CONFERENCE ON MOLECULAR NANOTECHNOLOGY, SAN FRANCISCO, CA, USA, 15-17 OCT. 1999, vol. 11, no. 2, pages 89-99, XP002275554 Nanotechnology, June 2000, IOP Publishing, UK ISSN: 0957-4484	1-4,6-8, 10-13,15
Y	page 94, paragraph 7 -page 95 ---	5,9,14, 16-20
X	US 5 019 660 A (CHAPMAN ORVILLE L ET AL) 28 May 1991 (1991-05-28)	1-4,6-8, 10-13,15
Y	figures 1,2 --- -/--	5,9,14, 16-20

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

5 April 2004

Date of mailing of the international search report

26/04/2004

Name and mailing address of the ISA

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Authorized officer

Dauw, X

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01 27028 A (UNIV SYRACUSE) 19 April 2001 (2001-04-19) figures 5,15,17 ---	1-20
A	US 5 347 063 A (CHAPMAN ORVILLE L ET AL) 13 September 1994 (1994-09-13) figures 4-9 ---	1-20
A	SRIVASTAVA D: "A phenomenological model of the rotation dynamics of carbon nanotube gears with laser electric fields" NANOTECHNOLOGY, DEC. 1997, IOP PUBLISHING, UK, vol. 8, no. 4, pages 186-192, XP002275556 ISSN: 0957-4484 figures 1,2 ---	17-20
P,X	US 2002/193648 A1 (DAHL JEREMY E ET AL) 19 December 2002 (2002-12-19) cited in the application the whole document ---	1,2,6, 10,15,17
P,X	DAHL J E ET AL: "Isolation and structure of higher diamondoids, nanometer-sized diamond molecules" SCIENCE, 3 JAN. 2003, AMERICAN ASSOC. ADV. SCI, USA, vol. 299, no. 5603, pages 96-99, XP002275555 ISSN: 0036-8075 figures 3,4 -----	1-20

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claim : 1

Nanoscale device using a diamondoid-based component

2. Claim : 2

Nanoscale device using a rod-shaped diamondoid component having an even number of adamantane subunits

3. Claim : 6

Nanoscale device using a rod-shaped diamondoid component having an odd number of adamantane subunits

4. Claim : 10

Nanoscale device using a bracket-shaped diamondoid component

5. Claim : 15

Nanoscale device using a screw-shaped diamondoid component

6. Claim : 17

Nanoscale device using a disc-shaped diamondoid component

Lack of unity of claims 1, 2, 6, 10, 15 and 17

The common concept linking claims 1, 2, 6, 10, 15 and 17 is the use of diamondoid-based components in a nanoscale device (claim 1).

Merkle R. C. et al (paragraphs 7 and 15) discloses the use of diamondoids as molecular building blocks for nano-devices. Therefore claims 2, 6, 10, 15 and 17 lack a novel common concept.

The different independent claims do not only lack unity with respect to each other, but the independent claims taken alone also lack unity.

Claims 2, 6, 10, 15 and 17 each define an infinite number of structures linked by the same common concept as the concept that links the different claims, i.e. the use of diamondoid-based components in a nanoscale device. As stated above Merkle et al disclose this common concept,

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

resulting in an infinite number of non-unitary inventions.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/22628

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/22628

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5019660	A	28-05-1991	CA 2100654 A1	13-08-1992
			WO 9213909 A1	20-08-1992
			AU 661654 B2	03-08-1995
			EP 0571377 A1	01-12-1993
			JP 6504981 T	09-06-1994

WO 0127028	A	19-04-2001	US 6531107 B1	11-03-2003
			AU 7999100 A	23-04-2001
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			BR 0206530 A	17-02-2004
			BR 0206531 A	23-03-2004
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			CZ 20031975 A3	15-10-2003
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			HU 0302721 A2	28-11-2003
			HU 0302725 A2	28-11-2003
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			NO 20033260 A	18-07-2003
			WO 02057201 A2	25-07-2002
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			US 2002134301 A1	26-09-2002
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			US 2002139295 A1	03-10-2002
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			US 2002147373 A1	10-10-2002
			US 2002143218 A1	03-10-2002
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			US 2002177743 A1	28-11-2002
			US 2002130407 A1	19-09-2002
			US 2003199710 A1	23-10-2003
